DEC 1951 51-48

U.S. Officials Only

SECRET

SECURITY INFORMATION

CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

25X1A

COUNTRY USSR

SUBJECT Soviet Bombers - Type 31 and Tupolev TuG-75 - Description of New Propeller - Turbine PTL-022

PLACE ACQUIRED (BY SOURCE) 25X1A

DATE ACQUIRED (BY SOURCE) [redacted]

[redacted]

DAS NO.	
OCI NO.	

25X1X

[redacted]

1. The long-range bomber command (ADD) of the Soviet Air Force has, according to the latest information, 900-1100 4-motor medium bombers at its disposal within the active units of its three strategic air armies including the Arctic Air Division. In addition, to these front-line units they have some 700 other medium bombers as Reserve Units. Among their front-line bombers are to be found in great preponderance piston-driven planes of the Tu-4, Tu-71, and Tu-70? types, which, as is known, are slightly improved copies of the Boeing B-29 or Boeing B-50. According to reliable new information among the first-line bombers are also to be found 400 machines of Type-31 equipped with propeller-turbines. The Reserve Units mentioned are still using to a certain extent the out-moded Tupolev TB-7 and the improved Petlyakov Pe-8, both 4-motor planes from World War II.

2. A false conclusion is the surmise which assumes that the Type-31 is identical with the 6-motor TuG-75. If this assumption indeed were true then the Soviet long-range bomber arm would have at its disposal over 400 6-motor planes today of the size of the Convair B-36 Conqueror. Actually the Type-31 is only 4-motored and can be designated as an enlarged B-29.

3. As of 30 Apr 53 the Soviet Aviation Industry had delivered only 17 6-motor Tupolev TuG-75 bombers. Fourteen of them are already in their (assigned) units and are undergoing testing in the field. There is no doubt that the Soviet Union is making an all-out effort to produce a large number of these machines - comparable to the B-36 - as fast as possible. Up to this time introduction (of this model) was delayed by the insufficient number of motors furnished.

4. Both the Model 31 and the TuG-75 today use the propeller-turbine of the Junker PTL-109-022 which was taken to the Soviet Union the night of 22-23 Oct 46 and there improved by the Junkers and BMW experts working together and under duress. Motor

DISTRIBUTION → STATE [X] ARMY [X] NAVY [X] AIR EV [X] FBI

PTL-022 was put into large-scale production in Khabarovsk in June 1952. The 4-motor bomber Model 31 which at first was equipped with piston-driven motors were changed over to the new PTL-022 propeller-turbine (the middle of 1952).

5. The 6-motor TuG-75 followed another line of development. It first used the jet turbine of the Lulkov model (probably Lu-4) and wasn't equipped with the propeller-turbine PTL-022 until the end of 1952. The propeller-turbine was preferred because the Lulkov turbine had too high a fuel-consumption rate and also originally was built for turbo-fighters.

6. The propeller-turbine PTL-022 (equipped) with axial compressor excelled because of astonishing fine performance and low fuel consumption. It is today the most modern airplane motor of the Soviet Bomber Command (ADD) and, indeed, both of the six as well as the four-motor bombers. One hundred fifty to 200 German and some 80-100 Soviet experts participated in its development in the Soviet Union. By April 1945 development of the Jumo PTL-109-022 together with single assembly of Jumo-Turbine TL-012 had taken place. However, up to this time they had not got beyond the first plans. According to these (plans) the new motor was to have an axial compressor, a three-stage turbine, with co-axially arranged and counter-rotating propellers and supplementary jet propulsion by means of the residual thrust. The motor was intended for a 4-motor plane. It was supposed to produce, in round figures, six thousand HP shaft-compensation capacity. [("Wellenvergleichsleistung") may also mean "competitive shaft output".] From a purely theoretical standpoint a fuel consumption rate of 350-380 g per HP/h was expected ("350 bis 380 g je PS/h"). The diameter decided upon was, in round figures, 1.10 m and the dry weight as planned was set at three thousand kg.

7. At the end of 1948 the Soviets set up the following requirements for the PTL-022: Static thrust performance five thousand shaft compensation HP, ("Wellenvergleichs-PS") fuel consumption not over 320 g/HP/h. ("320 g/PS/h"). Twenty test models were ordered made. The completed motors were, beginning with the Summer of 1950, subjected to several 100-hr test runs followed by official 80-hr test runs. Since the Soviets also enlisted in the development of the PTL-022 the help of experts from the Bayrischen Motoren-Werke (BMW) [Bavarian Motors Works] who influenced the whole work, the result was various improvements with typical BMW characteristics. For example, the combustion chamber system was no longer built according to the old Junker system but combined with the BMW system so that the individual combustion chamber heads of the Junker were retained but discharge into an annular of the BMW (according to BMW experience) in which combustion chamber heads extend over 2/3 of the total distance. It is said that this system has significant manufacturing-technical and thermodynamic advantages. The Soviet PTL-022 had at the outset co-axially counter-rotating propellers. It was noteworthy in this connection that the bearing pressure of the two propellers was distributed by means of a differential gear of 57 percent to 43 percent to the front or rear propeller. The propeller blades were very wide and had a very small diameter (in the drawings 3.5m). The series engines ("Seriontriebwerke") now have allegedly a 4-blade propeller with very broad blades. Good progress was made with lowering the fuel consumption. This still amounted to 305 g/HP/h ("305/g/PS/h") at the beginning of 1951, consequently in the meantime it was possible to reduce it to 280 g/HP/h ("280 g/PS/h"). The serie engines ("Serientriebwerke") are reported to consume 2,850 liters/hr of Soviet kerosene with 5,500 HP shaft compensation capacity ("Wellenvergleichsleistung"). That means (with a specific gravity of 0.83 for Soviet kerosene) 2,360 kg/h or 428 g/HP/h ("428 g/PS/h"). The much better consumption mentioned above was ascertained for the most favorable height at five thousand HP whereas the higher consumption figure is determinative for a five thousand HP performance on the ground.

8. A motor is useful in the Soviet Union only if it starts easily in the Polar regions and in winter. Particular attention had therefore to be given to ease of starting. The German group in Kuibyshev designed a small gas-turbine starting-gadget, designated TS-1, for this purpose. It was ready for testing in the summer of 1950 and 500 satisfactory starting tests were completed whereupon the Soviets

immediately demanded one thousand starts in immediate succession with this starter.

9. The apparatus had a small 200-watt starter motor which ran on a mixture of kerosene and five percent lubricating oil. This was good for a maximum running time of 90 sec, which is satisfactory in bringing the propeller turbine to 2,500 rpm when idling. The importance of such a starter for a motor to operate under Arctic weather conditions is obvious. The starter is 0.60 m long and has a diameter of 0.30 m. The small turbine makes ten thousand rpm; the compressor 36 thousand rmp.

10. The data on the Soviet version of the PTL-022 are as follows: 14 stage axial compressor; 3-stage turbine either operating 2 counter-rotating co-axially working 4-blade propellers or a 4-blade propeller; combustion chamber system of the Junkers-BMW type; fuel pumps modified Barmag-gear type pumps, injection nozzles similar to the UK Rolls-Royce Nene with 2 x 60 l/min at 90 kg/cm^2 injection pressure; dry weight as planned two thousand - 2,100 kg and somewhat more in the series model; dimensions approximately as in the German draft 109-022; shaft compensation capacity / or perhaps competitive shaft output_/("Wellenvergleich-sleistung) five thousand HP (4500 HP/538 kgp residual thrust - 4500 ≠ 500 HP = five thousand HP) ("4,500 PS ≠ 538 kgp Restschub = 4,500 ≠ 500 PS = five thousand PS"); Turbine revolutions 7,500 rpm; compressor ratio 1:4.7; air throughout 28 to 31 kg/sec.

11. With four propeller turbines PTL-022 Type (Model) 31 is an enlarged Boeing B-29. The dimensions of this model are according to reports received: spread 56.40 m; length 44.20 m. The distinguishing difference vis-a-vis the Tu-4 and Tu-71 lies, apart from the difference in size, chiefly in the use of propeller-turbines. In the air it is easily recognized by the auxiliary ("zusatzlich") air-intake on top of the motor nacelles which is to be found on the radial motors of the Tu-4 and Tu-71 (modeled on the Wright R-3350) underneath on the motor cowling (nacelles) as is well known.

12. The motor nacelles ("Triebwerkvorbauten") of Model (Type) 31 are unusually long. The tail-end of the nacelles is naturally easy to distinguish from that of radial motors. The distinctive propellers can, of course, be recognized only when standing idle. At one time, furthermore, counter-rotating built-in three-blade propellers were used; recently however, only <u>one</u> four-blade propeller. Model 31 achieved a range of 10,400 km and a top speed of 720 km/hr with the original built-in radial motors. The range, because of the low consumption of the propeller-turbines, is probably not much less with these propeller turbines; the top speed, on the other hand, considerably better. In any case, the range of Model 31 is sufficient to complete a flight from the Soviet bases to the US and back again. The Soviet versions of the B-29 have insufficient range to make the same flight; on the contrary they can only reach US targets if they either re-fuel in the air, which has already been done, or if they forego the return flight. Since the TuG-75 described below is not yet available in large numbers and is partly equipped with jet turbines also, which have an essentially shorter range as a result, Type (Model) 31 as a matter of fact is the only bomb-carrier for use against US targets at the present time. However, the bomb-load of Model 31 does not approach that of the B-36.

13. Some machines do all their flying in the Arctic. It is to be assumed that it is the Model 31 that flies over the North Pole at a great height regularly on Tuesdays, Thursdays, and Saturdays. The vapor trails are occasionally to be seen from Alaska and beyond. The air bases of the units, which are equipped with Model 31, are to be found in the area of Archangel and Anderma/sic/ in the Arctic Ocean, on the Novilsk /sic/ airport in North East Siberia and on the Kamchatka Peninsula and Anodirsk /sic/ This type has not yet been found in the western part of the Soviet Union if one disregards a long-range flight by one of them in September 1952 which, with a wartime (bomb) load, ended up in Poland.

14. The six-motor TuG-75 which is often mistaken for Model 31, is being built by the Soviets in two models. There was formerly a version with six Lulkov-jet turbines

each with 5,200 kgp thrust and the other was a Model (equipped) with the PTL-022 propeller-turbine. The Lulkov motor did not meet expectations. Fuel consumption is still too high so that a range of only some 6,600 km can be attained by it. The motor has a weight of some 2,900 kg, a length of 6.2 m and an overall diameter of 1.63 m. Structure and form of the TuG-75 have already been described in many publications. The fully confirmed principles underlying it are not as yet available and several points still remain uncertain. Test flights with the propeller-turbine model of the TuG-75 have been carried out at the Kuibyshev airport on the Volga. At that place will be found one of the two development stations of the propeller-turbine PTL-022. The heavy bomber is being turned out in airplane plants in Siberia and in the Far East. Such places as Komsomolsk, Khabarovsk and recently Magadan /sic/ also are named in this connection. In field tests planes of this model have carried out long-range flights from Northern Siberia to the Kamchatka Peninsula. On these flights distances up to six thousand km have been covered. It has already been mentioned that a detachment of the Soviet Bomber command (ADD) is equipped with the TuG-75. It is certain that this detachment is not yet ready for combat duty.

- end -